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## San Antonio Lab Technology Supports Navy Dentistry

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**Cmdr. David Leal, head, Biomaterial and Environmental Surveillance Team, Naval Medical Research Unit- San Antonio**



Cmdr. David Leal (right) head of the NAMRU-SA Biomaterial and Environmental Surveillance Team, observes Dr. Yoon Hwang demonstrate the features of the LC/MS to detect Bisphenol A (BPA) in dental wastewater. (Photo courtesy of NAMRU-SA)

Our group, at Naval Medical Research Unit in San Antonio, conducts research, development, testing and evaluation of biomaterials used in medicine and dentistry.

As the lead agent for mercury abatement in naval dental treatment facilities, we are responsible for the development and testing of systems and technologies that minimize the environmental impact and occupational hazards of Navy dentistry.


We recently installed two new instruments with the latest groundbreaking analytical capabilities. These instruments will provide the laboratory with the enhanced capability to identify various elements and molecules in multiple ongoing and future research areas that focus on ways to enhance the health, safety, performance, and operational readiness of our Sailors and Marines.


The procurement of an Atomic Absorption Spectrophotometer (AA) will allow us to completely characterize of metals in dental wastewater. At this point, we have successfully quantified mercury, silver, and copper extracted from dental amalgam. The AA allows us to monitor metal quantities as low in the parts per billion range, or micrograms per L. The ability to detect mercury at this level will ensure we successfully meet the EPA requirements


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for mercury abatement within our dental treatment facilities.

The AA device can also be used to quantify concentrations of silver, gold or iron nanoparticles, as well as detect arsenic and selenium as well as a range of other hydride-forming elements. In addition, AA will also be used at NAMRU-SA to assess the roles of metals to combat antibiotic resistant infections.

Our second recently installed instrument is a High Performance Liquid Chromatography Triple Quadrupole Mass Spectrometer (LC/MS/MS), which makes it possible to characterize molecules, such as organometallics that are present in dental wastewater at extremely low concentrations.

The LC/MS/MS not only provides low detection capability, but can also characterize the molecular state of a substance. The characterization of a molecule is of even greater importance than simply a basic analysis of the metals present. For example, metallic mercury is fairly safe, and when bound with other metals in amalgam, is practically inert. However, the mercury found in fish is a potent toxicant. The ability to analyze a range of substances at ultra-low concentrations provides opportunities to evaluate current remediation techniques or to determine potentially harmful environmental conditions prior to escalation to toxic levels.

The LC/MS/MS can also be used to measure biomarkers, growth factors, toxins, pesticides and much more in human tissues and in environmental samples.

The mission of NAMRU-SA is to conduct medical, craniofacial, and directed energy biomedical research, which focuses on ways to enhance the health, safety, performance, and operational readiness of Navy and Marine Corps personnel and addresses their emergent medical and oral/facial problems in routine and combat operations. For more information on the research we do visit our web site:  
<http://www.med.navy.mil/sites/nmrc/Pages/namrusa.htm>

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